

Applicants : Hermann Franzen and Joachim Kröll  
For : TRANSFER PLANT AND METHOD FOR LOADING  
AND UNLOADING CONTAINERS FROM  
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The listing of the claims will replace all prior versions and listings of claims in the application:

**LISTING OF CLAIMS:**

Please amend claims 1-17.

Please add new claims 18-30 as follows:

1. (Currently Amended) ~~Transfer~~ A transfer plant, especially for loading and unloading ISO containers from container ships at seaports, comprising:

~~with a vertical support which is propped up at the land side and on which a horizontal extension arm is braced, which by said vertical support, wherein said horizontal extension arm~~ protrudes across the ship that is to be unloaded on the sea side; and

~~along which a horizontal conveying device is adapted to travel, which along said extension arm, wherein said conveying device cooperates with land-side and sea-side hoisting and lowering devices that pick up and put down the containers, being that are arranged at the land and sea side and also on the horizontal extension arm, characterized in that wherein said conveying device comprises~~ at least two horizontal conveying devices (9, 10) are arranged on the ~~said~~ horizontal extension arm (1.4, 1.5, 1.6), ~~which can~~ wherein ~~said at least two horizontal conveying devices are adapted to travel independently of each other and alongside each other between the land-side and sea-side hoisting and lowering devices (11, 13) along the ~~said~~ horizontal extension arm (1.4, 1.5, 1.6).~~

2. (Currently Amended) ~~Transfer~~ The transfer plant per claim 1, characterized in that including intermediate storage devices (12, 14) that are arranged on the horizontal extension arm (1.4, 1.5, 1.6) in the region of at least one chosen from the land-side and/or the sea-side hoisting and lowering devices (11, 13), wherein containers can be put down or picked up by the land-side or sea-side hoisting and lowering devices (11, 13), as well as the horizontal conveying devices (9, 10).

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3. (Currently Amended) ~~Transfer~~The transfer plant per ~~claims 1 or~~claim 2, characterized in that ~~wherein~~ the ~~said~~ horizontal extension arm is ~~divided into~~comprises a rigid base arm (1.4) at the sea side, a swivel arm (1.5) joined to it at the sea side, and a rigid extension arm (1.6) protruding at the land side; ~~the~~said rigid sea-side base arm (1.4) and ~~the~~said rigid land-side arm (1.6) are ~~being~~ fastened to ~~the~~said vertical support (1.3), and ~~wherein~~ the ~~said~~ rigid sea-side base arm (1.4) accommodates ~~the~~said sea-side hoisting and lowering device (11) in the position of rest of the transfer plant, in which ~~the~~said sea-side swivel arm (1.5) is swiveled upward.

4. (Currently Amended) ~~Transfer~~The transfer plant per ~~one of~~claims 1 toclaim 3, characterized in that ~~the~~ including a railway carried by the sea-side portion (1.4, 1.5) of ~~the~~said horizontal extension arm ~~carries a~~, wherein ~~said~~ railway (5) is for movement of a trolley (6) of the sea-side hoisting and lowering device (11), wherein ~~the~~said land-side hoisting and lowering device (13) is fastened at the land-side portion (1.6) of ~~the~~said horizontal extension arm, ~~and~~said transfer plant further including other railways (7, 8) for the horizontal conveying devices (9, 10) are arranged on both sides next to ~~the~~said railway (5) of the sea-side hoisting and lowering device (11) and next to the land-side hoisting and lowering device (13) and thus essentially along the entire horizontal extension arm (1.4, 1.5, 1.6).

5. (Currently Amended) ~~Transfer~~The transfer plant per claim 4, characterized in that ~~the~~wherein ~~said~~ vertical support (1.3) is fashioned in the shape of a tower, ~~the~~wherein ~~said~~ railway (5) for the hoisting and lowering device (11) ends in the region of ~~the~~said vertical support (1.3), and ~~the~~said other railways (7, 8) for ~~the~~said horizontal conveying devices (9, 10) run laterally past the vertical support.

6. (Currently Amended) ~~Transfer~~The transfer plant per ~~one of~~claims 2 toclaim 5, characterized in that ~~the~~wherein ~~said~~ intermediate storage devices (12, 14) each comprise a downwardly extending support column (12.1, 14.1), at whose lower end is attached ~~and~~ a

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horizontal swivel arm (12.2, 14.2), at whose end away from the support column (12.1, 14.1) is hinged-attached at a lower end of said support column and a carrying frame (12.3, 14.3), whichhinged at an end of said swivel arm away from said support column, wherein said carrying frame can swivel both into the region underneath thesaid sea-side or land-side hoisting and lowering device (11, 13) and into the region of thesaid two horizontal conveying devices (9, 10) into corresponding pick-up and hand-off positions for the picking up or handing off of a container (19).

7. (Currently Amended) Transfer The transfer plant per claim 6, characterized in that thewherein said sea-side swivel arm (12.2) and thesaid sea-side carrying frame (12.3) can each swivel at least  $\pm 90^\circ$  about their vertical axis, independently of each other.

8. (Currently Amended) Transfer The transfer plant per claim 6 or 7, characterized in that the including a parallelogram type coupler mechanism, wherein said swivel mechanism of the at least one chosen from said land-side carrying arm (14.2) and/or the and said land-side carrying frame (14.3) can be driven by asaid parallelogram type coupler mechanism (34), so that the orientation of the container (21) remains unchanged during the swivel motion.

9. (Currently Amended) Transfer The transfer plant per one of claims 6 to claim 8, characterized in that thewherein said carrying frame (12.3, 14.3) for the container (19, 21) can be swiveled into a central swivel position between the two pick-up and hand-off positions in the region of thesaid railways (7, 8), where the container can be connected to or detached from thesaid sea-side or land-side hoisting and lowering device (11).

10. (Currently Amended) Transfer The transfer plant per one of claims 1 to claim 9, characterized in that thewherein said horizontal conveying devices (9, 10) each consist ofcomprise a frame (29) with a rail traversing mechanism (30) that can travel on thesaid railways (7, 8), a hoisting mechanism (31) and a spreader (32) to receive the container (19) which has been swiveled and positioned underneath the spreader (32).

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11. (Currently Amended) ~~Transfer~~The transfer plant per ~~one of~~ claims 1 to ~~claim~~ 10, characterized in that ~~the~~wherein said land-side hoisting and lowering device (13) is configured as a lift guided on ~~the~~said vertical support (1.3), which consists of wherein said lift comprises a trolley (23), guided on a horizontal hoisting beam (13.1), with a load suspension means (22) for the container (21), wherein ~~the~~said hoisting beam (13.1) is suspended from hoisting cables (24) and linked by a cross rail (balancing arm 13.2) to guide rollers (13.3) that can roll against ~~the~~said vertical support (1.3).

12. (Currently Amended) ~~Transfer~~The transfer plant per claim 11, characterized in that the including hoisting cables (24) of thesaid land-side hoisting and lowering device (13) that are coupled to a mobile counterweight (33) to at least partly compensate for the natural weight of thesaid land-side hoisting and lowering device (13).

13. (Currently Amended) ~~Transfer~~The transfer plant per ~~one of~~ claims 1 to ~~claim~~ 12, characterized in that including a loading station (15, 16) that is arranged beneath thesaid land-side hoisting and lowering device (13), said loading station having two pick-up and hand-off positions that can travel alternately underneath thesaid hoisting and lowering device (13), cooperating with a horizontal conveying system (17).

14. (Currently Amended) ~~Transfer~~The transfer plant per ~~one of~~ claims 1 to ~~claim~~ 13, characterized in that ~~the~~wherein said transfer plant (1) has a gantry type substructure (1.1), supported on said rail traversing mechanisms (1.2), thewherein said extension arm (1.6) protrudes across thesaid substructure (1.1) on the land side, and thesaid vertical support (1.3) is propped up centrally on thesaid substructure (1.1) at the land side.

15. (Currently Amended) ~~Method~~A method of loading and unloading of containers from container ships ~~by means of a transfer plant (1), especially according to one or more of claims 1 to 16,~~ with a vertical support (1.3) which is propped up at the land side and on which a

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horizontal extension arm (1.4, 1.5 and 1.6) is braced, whichwherein said extension arm protrudes across the ship (3) that is to be unloaded on the sea side and along which at least two horizontal conveying device (9, 10) devices can travel, whichwherein said conveying device cooperates with hoisting and lowering devices (9, 10) [sie] that pick up and put down the containers (18, 19, 21), said hoisting and lowering devices being arranged at the land and sea side and also on thesaid horizontal extension arm (1.4, 1.5 and 1.6), withwherein said at least two horizontal conveying devices (9, 10) are arranged on the horizontal extension arm (1.4, 1.5, 1.6), whichand can travel independently of each other between the land-side and sea-side hoisting and lowering devices (11, 13) along the horizontal extension arm (1.4, 1.5, 1.6), and with intermediate storage devices (12, 14) arranged on the horizontal extension arm (1.4, 1.5, 1.6) in the region of at least one chosen from the land-side and or and the sea-side hoisting and lowering devices (11, 13), where containers can be put down or picked up by the land-side or sea-side hoisting and lowering devices (11, 13), as well as the horizontal conveying devices (9, 10), characterized by the sequence of the following work steps, the method comprising:

- a) for the unloading of containers from a container ship (3) tied up at the dock (2), providing a spreader and picking up a container (18, 19, 21) is picked up by asaid spreader (20) of the sea-side hoisting and lowering device (11), which has been positioned on the horizontal extension arm (1.4, 1.5, and 1.6) above the container (18, 19, 21), and raised to a maximum hoisting height,
- b) providing a horizontally swiveling carrying arm having a horizontally swiveling carrying frame at the intermediate storage device arranged on the sea-side hoisting and lowering device (11), with a horizontally swiveling carrying arm (12.2) and a horizontally swiveling carrying frame (12.3) arranged on it, is swiveled said carrying arm and carrying frame swiveling from itsa position of rest underneath a railway (7, 8) of the two horizontal conveying devices (9, 10) into a position underneath the container (18, 19, 21),

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- c) placing the container (18, 19, 21) is placed down on the carrying frame (12.3) and swiveledswiveling the container along with itssaid carrying frame under one of the two railways (7, 8) of the horizontal conveying devices (9, 10),
- d) positioning at least one of the horizontal conveying device[s] (9, 10) positioned above the container (18, 19, 21) on the carrying frame (12.3) receivesreceiving the container (18, 19, 21) and transportsittransporting the container to the end of the land-side extension arm (1.6), while the sea-side hoisting and lowering device (11) picks up a new container (18, 19, 21),
- e) handing off the container at the land-side end of the extension arm (1.6), the container (18, 19, 21) is handed off to a carrying frame (14.3) of a second intermediate storage device (14), having a downwardly extending support column (14.2), which has beenswiveled and swiveling said carrying frame by a horizontal swivel arm (14.1) into the region of the railways (7, 8) of the horizontal conveying devices (9, 10) underneath the container (18, 19, 21),
- f) after detaching the container (18, 19, 21) from the horizontal conveying device (9, 10), swiveling the carrying frame (14.3) with the container (18, 19, 21) is swiveled under the hoisting mechanism of the hoisting and lowering device (13) hinged to the land-side extension arm (1.6), whereand picking up the container (18, 19, 21) is picked up by a spreader (22),
- g) afterswiveling the carrying frame (14.3) swivels back, and lowering the container (18, 19, 21) is lowered by the hoisting and lowering device (13) and handedhanding off the container to a horizontal conveying system (15, 16) on the ground,
- h) at the same time as the above described work stepsconcurrently with steps a through g, picking up a second container (18, 19, 21) picked up by the sea-side hoisting and lowering device (11) is transportedand transporting the second container by the second horizontal

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conveying device (9, 10) across its other railway (7, 8) to the end of the extension arm (1.6) at the land side, where ~~it~~the second container is handled in the same fashion, and

i) performing the above-mentioned work steps are performed a through h in reverse sequence for the loading processcontainers on a ship.

16. (Currently Amended) ~~Method~~The method per claim 15, characterized in thatwherein the container (18, 19, 21)that is oriented transversely to the lengthwise axis of the extension arm when picked up by the first hoisting and lowering device (11) is swiveled into a predetermined position parallel to the extension arm (1.4, 1.5, 1.6) by one chosen from the carrying arm (12.2) ~~and/or~~and the carrying frame (12.3) swiveling through +/-90°.

17. (Currently Amended) ~~Method~~The method per claim 15 or 16, characterized in thatwherein the container (18, 19, 21)that is oriented parallel to the extension arm (1.4, 1.5, 1.6) when placed on the carrying frame (14.3) of the second land-side hoisting and lowering device (13) remains unchanged in its orientation when swiveled into the region of the hoisting and lowering device (13) ~~thanks to~~as a result of opposite swivel movements of the carrying arm (14.2) and carrying frame (14.3).

18. (New) The method per claim 15, wherein the container that is oriented parallel to the extension arm when placed on the carrying frame of the second land-side hoisting and lowering device remains unchanged in its orientation when swiveled into the region of the hoisting and lowering device as a result of opposite swivel movements of the carrying arm and carrying frame.

19. (New) The transfer plant per claim 1, wherein said horizontal extension arm comprises a rigid base arm at the sea side, a swivel arm joined to it at the sea side, and a rigid extension arm protruding at the land side; said rigid sea-side base arm and said rigid land-side arm being fastened to said vertical support, wherein said rigid sea-side base arm accommodates

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said sea-side hoisting and lowering device in a position of rest of the transfer plant, in which said sea-side swivel arm is swiveled upward.

20. (New) The transfer plant per claim 1 including a railway carried by the sea-side portion of said horizontal extension arm, wherein said railway is for movement of a trolley of the sea-side hoisting and lowering device, wherein said land-side hoisting and lowering device is fastened at the land-side portion of said horizontal extension arm, said transfer plant further including other railways for the horizontal conveying devices arranged on both sides next to said railway of the sea-side hoisting and lowering device and next to the land-side hoisting and lowering device essentially along the entire horizontal extension arm.

21. (New) The transfer plant per claim 20, wherein said vertical support is fashioned in the shape of a tower, wherein said railway for the hoisting and lowering device ends in the region of said vertical support, and said other railways for said horizontal conveying devices run laterally past the vertical support.

22. (New) The transfer plant per claim 2, wherein said intermediate storage devices each comprise a downwardly extending support column and a horizontal swivel arm attached at a lower end of said support column and a carrying frame hinged at an end of said swivel arm away from said support column, wherein said carrying frame can swivel both into the region underneath said sea-side or land-side hoisting and lowering device and into the region of said two horizontal conveying devices into corresponding pick-up and hand-off positions for the picking up or handing off of a container.

23. (New) The transfer plant per claim 22, wherein said sea-side swivel arm and said sea-side carrying frame can each swivel at least  $\pm 90^\circ$  about vertical axis, independently of each other.

24. (New) The transfer plant per claim 6 including a parallelogram type coupler mechanism, wherein said swivel mechanism of at least one chosen from said land-side carrying arm and

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said land-side carrying frame can be driven by said parallelogram type coupler mechanism, so that the orientation of the container remains unchanged during the swivel motion.

25. (New) The transfer plant per claim 6, wherein said carrying frame for the container can be swiveled into a central swivel position between the two pick-up and hand-off positions in the region of said railways, where the container can be connected to or detached from said sea-side or land-side hoisting and lowering device.

26. (New) The transfer plant per claim 1, wherein said horizontal conveying devices each comprise a frame with a rail traversing mechanism that can travel on said railways, a hoisting mechanism and a spreader to receive the container which has been swiveled and positioned underneath the spreader.

27. (New) The transfer plant per claim 1, wherein said land-side hoisting and lowering device is configured as a lift guided on said vertical support, wherein said lift comprises a trolley, guided on a horizontal hoisting beam, with a load suspension means for the container, wherein said hoisting beam is suspended from hoisting cables and linked by a cross rail to guide rollers that can roll against said vertical support.

28. (New) The transfer plant per claim 27 including hoisting cables of said land-side hoisting and lowering device that are coupled to a mobile counterweight to at least partly compensate for the natural weight of said land-side hoisting and lowering device.

29. (New) The transfer plant per claim 1 including a loading station that is arranged beneath said land-side hoisting and lowering device, said loading station having two pick-up and hand-off positions that can travel alternately underneath said hoisting and lowering device, cooperating with a horizontal conveying system.

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30. (New) The transfer plant per claim 1, wherein said transfer plant has a gantry type substructure, supported on said rail traversing mechanisms, wherein said extension arm protrudes across said substructure on the land side, and said vertical support is propped up centrally on said substructure at the land side.